

lated to shake the generally received opinion of a progressive organization of animals during geological time, the lower preceding the higher.

But can the same be said for plants? Coniferæ are among the most rife in the earliest strata in which land plants abound, and these are reckoned, by some of our best botanists, the highest types of plants! Dicotyledons succeed; and Monocotyledons, the least complex of the flowering plants, scarcely appear till Tertiary times. Has there been an inverse order of creation for plants, compared with that of animals? Is it true that Palms and Bananas are inferior to the Cypress and the Fir-tree?

V.—*Notes on the Hydroid Zoophytes.* By Prof. ALLMAN.

I. *Tubularia indivisa*.

THE reproductive sacs of *Tubularia indivisa*, though never destined to become free, and belonging to the type of *sporosacs* rather than *Medusæ*, present nevertheless a structure in which a true medusoid type may be fully recognized, and are thus of especial interest in establishing the exact relation between *sporosacs* and *Medusæ*, the two forms of bodies in one or other of which the generative elements of the marine Hydroid Zoophytes always originate.

Included within an external investment, or *ectothèque*, in which thread-cells are imbedded, is a second sac, having a well-defined opening near its summit. A circular canal, rendered evident by the red pigment-granules it contains, surrounds this opening. Four longitudinal canals open symmetrically into the circular canal, and thence, running along the inner side of the walls of the sac, enter the base of a large manubrium\*, which extends through the axis of the sac.

Between the endoderm and ectoderm of the manubrium the generative elements (ova or spermatozoa) are developed, and when sufficiently mature escape, after the rupture or absorption of the confining ectoderm, through the opening in the sac just described, the *ectothèque* giving way before them, apparently by rupture.

It is impossible not to see here, in the sac which lies immediately within the *ectothèque*, the umbrella of a *Medusa*, with its orifice and its circular and radiating canals; so that in this highly interesting form of *sporosac* we have, with a closed manubrium, all the parts amply represented which are found in

\* The diverticulum from the *cœnosarc* which extends through the axis of the *sporosac*, or forms the so-called peduncle of the *Medusa*.

the free Medusa, except the marginal tentacles, ocelliform bodies, lithocysts, and velum (?).

In the female sporosac, the generative product originates as a voluminous plasma, between the endoderm and ectoderm of the manubrium. It is evidently in more intimate relation with the endoderm than with the ectoderm, and as it increases in bulk it would seem to cause the absorption of the latter membrane, which confined it in its young state. A portion of it now becomes detached from the mass, and soon undergoes a special development into an embryo within the cavity of the sporosac. We must undoubtedly look upon this detached portion as an ovum, though I have never succeeded in demonstrating the presence of a germinal vesicle. The phænomenon of yelk-cleavage is also very obscure, but the entire ovum may be easily broken up into cells filled with secondary cells.

The ovum lies in contact with the remainder of the plasma, and while in this position becomes developed into an actiniform embryo, as has been pointed out by Van Beneden and others. In the act of development it becomes first extended as a disk over the residual plasma. Next; from the circumference of the disk, short and thick processes radiate all round, which soon elongate themselves into tentacula. The disk at the same time gradually becomes more gibbous on the side turned away from the axis of the sporosac; its interior becomes hollowed out into a stomach; and a mouth makes its appearance in the centre of the opposite side, or that in contact with the plasma. The embryo now retreats from the plasma, the mouth is seen to be elevated on a conical prominence, and a second circle of tentacula soon makes its appearance immediately around it. In this state it escapes from the sporosac, and after continuing free for a period it ultimately develops, from the side opposite to the mouth, a cylindrical stem, which soon clothes itself with a polypary, and fixes the young *Tubularia* to some neighbouring object.

While embracing the residual plasma in the sporosac, we are strongly reminded of the relation which subsists between the embryo and food-yelk, in those animals in which the embryo is developed from only a portion of the yelk. The analogy, however, is not so close as it may at first appear; and there is no evidence that the residual plasma is absorbed by the embryo during its development.

After the escape of the embryo, or even during its development within the sporosac, the remains of the plasma may still throw off portions which become developed in a similar way into free embryos.

In the male sporosacs, the spermatogenous tissue is manifestly composed of very delicate tubules, which are attached by one ex-

tremity to the endoderm of the manubrium, and thence radiating in all directions, fill the interspace between the endoderm and ectoderm with a dense tissue, in whose component tubules the spermatozoa, with their generating cells, are formed.

## II. *Podocoryne carnea*.

I recently obtained, upon stones in rock-pools near low-water mark, and on old shells brought up upon the lines of the fishermen, a zoophyte which appears to be identical with a species described by Sars under the name of *Podocoryna albida*,—an animal, however, which seems to be only a variety of the zoophyte described by the same author under the name of *P. carnea*.

It consists of a colony of colourless claviform polypes springing from a common tubular basis, which invests the surface of the stone or shell. The polypes are of two kinds, of which one rises to the height of about  $\frac{1}{4}$  inch above the common basis. Its extremity is club-shaped, and bears a terminal mouth, behind which is situated a series of about twelve filiform tentacula, arranged in a single verticil. The polypes of this kind never bear gonophores (“generative vesicles”).

The other kind of polypes spring, in common with those just described, from the tubular base. They are scarcely half the size of the former, and have only four or five tentacula, which are situated, as in the larger polypes, behind a terminal mouth, while, at a short distance behind the tentacula, there is always borne a verticil of medusiferous gonophores, generally four or five in number, each supported on a short peduncle.

Sars, in his description of *P. carnea*, states that the polypes are connected to one another by “a kind of foot or mantle, which forms upon the shells a thin membranous investment, and which appears to consist of numerous stolons anastomosing with one another;” but he makes no mention in this description of a chitinous polypary.

He tells us, however, a little further on, that, “after the death of the polype, the mantle remains behind as a brown epidermal investment, bearing numerous pointed spines of a horny nature, and which we may probably consider as a kind of polypary.” He has met with this investment upon shells from different seas.

This latter part of his description is not consistent with the former; and it seems probable that he has confounded the solid muricated and chitinous basis of *Hydractinia* with the tubular basis of the present genus.

Sars describes his zoophyte as naked; but I believe this is not admissible as a character in any of the known marine Hydroid zoophytes, unless it be in *Hydractinia*, in which the solid chi-

tinous polypany is covered *externally* by the cœnosarc, thus reminding us of the sclerobasic corallum of some of the Actinozoa.

In the present species the common basis of the colony consists of an irregular network of chitinous tubes pervaded by the cœnosarc, and closely adherent to the surface of some fixed object. I had long ago satisfied myself of the presence of a basal tubular polypany in *Clava*; but, though I had carefully figured it with a view to publication, I delayed making it known, and in the meantime the same fact had been fully observed and recorded by Dr. S. Wright.

The medusa of *Podocoryne albida* has a deep umbrella with eight marginal tentacles, of which four are longer and continuous with the four radiating canals, and four shorter and alternate with them. Each tentacle springs from a bulbous base containing red pigment-granules. There is also a wide velum.

The manubrium is of moderate length; and its oral end is divided into four lobes, each of which is terminated by a cluster of thread-cells, which are peculiar in the fact of every thread-cell being borne on the summit of a delicate thread-like peduncle. The entire cluster may be seen in a constant state of vibration,—a phænomenon, however, which is probably due merely to the action of currents excited in the surrounding water by cilia situated within the mouth.

It is apparently the present zoophyte, or at least a nearly allied species, which has been described by Mr. Peach in a former volume of this Journal.

### III. *Manicella fusca*, nov. gen. et sp.

There occurs in the Firth of Forth, attached to other zoophytes and to sea-weeds near low-water spring tides, a Tubularian zoophyte with characters so peculiar as to entitle it to a distinct generic rank.

It is much branched, rising usually to the height of about  $\frac{1}{2}$  an inch, and having its ultimate ramuli disposed with a regularly pinnate arrangement.

The tentacles are about 16 in number, arranged in a single but slightly alternating series upon the club-shaped body, just behind an anterior conical projection which bears the mouth on its apex.

The polypany, which is of a dull brown colour, and opaque from the accumulation in it of minute particles of earthy matter and siliceous sand, presents the remarkable character of not being confined to the cœnosarc, but being continued over the body of the polype, and even for a considerable distance over the tentacles themselves; so that the only part of the zoophyte which

is naked is a small portion of the body just behind the mouth, and the terminal portion of the tentacles, which, when these are in the extended state, comprises a space of somewhat less than two-thirds of their entire length,—a character of true generic value. At the origin of the polypiferous ramuli, the polypary is marked by distinct spiral corrugations.

The gonophores belong to the class which contain sporosacs, and not Medusæ. They are borne each upon the summit of a short lateral branch, three or four of which are situated alternately along the entire length of the ultimate ramuli, and have their investing polypary marked by spiral corrugations. The polypary is continued over the entire gonophore. Each gonophore contains a single sporosac with a ramified spadix\*.

I have not been able to find any description of the present animal, though Dr. S. Wright informed me last year that he had met with a Tubularian zoophyte in which the greater part of the polype was covered by the polypary. If it really prove to be an undescribed form, I would propose for it the name of *Manicella*† *fusca*, which is sufficiently expressive of some of its more striking characters.

#### IV. *Eudendrium bacciferum*, nov. sp.

Growing upon the basalt of some of the small rocky islands of the Firth of Forth, or attached to other zoophytes or to seaweeds, there may be found near low-water mark a small Tubularian zoophyte, which also presents a form which may prove of generic value, but at all events is one of well-marked specific distinctness from any with which I am acquainted.

It attains a height of about an inch. It is much and irregularly branched, though the ultimate or polypiferous ramuli present for the most part a pinnate arrangement. The main stem is thickest near the root, and is here distinctly composed of aggregated tubes. It becomes gradually attenuated as it gives off its branches, and finally, like the branches, consists of a simple tube.

The ultimate ramuli are for the most part abruptly bent to one side, a little behind their terminal polypes,—a character which gives a special and rather peculiar aspect to the zoophyte.

The polypary is slightly corrugated on the branches, without being anywhere distinctly annulated, and is continued over the

\* The endodermal portion of the manubrium, from which the generative elements directly originate.

† A diminutive noun, from *manica*, the long Roman sleeve which performed the office of a glove; the allusion is to the extension of the polypary over the body and tentacles of the polype.

posterior part of the body of the polype in the form of a funnel-shaped cup, which does not, however, extend as far as the origin of the tentacles, and which, though it reminds us of the polype-cell in the Campanularian zoophytes, is incapable of receiving the tentacles and anterior part of the polype even in extreme retraction.

The tentacula are seated near the middle of the club-shaped body. They are about ten in number, and are arranged in a single verticil. Their cavity presents the septate appearance usual in the marine polypes; but under slight pressure the contents of the stomach are easily forced into them without any evident rupture of the tissues.

The body in front of the tentacles is continued into a long, conical, but mutable, mouth-bearing process.

The gonophores are remarkably large, and are chiefly formed upon the main stem and primary branches. They are of an oval figure, each borne on a long peduncle which issues from the summit of a very short lateral ramulus, invested like the other branches with a proper polypary, which is here, exactly as in the polypiferous ramuli, dilated at its summit so as to form a conical cup, from whose centre the peduncle of the gonophore springs.

The contents of the gonophores in this species are sporosacs; and in the structure of these there are some points which deserve attention. Lining the inner surface of the ectothèque, and interposed between it and the endothèque or sac which immediately confines the generative elements, is a third investment, which is plainly homologous with the umbrella of a Medusa. It supports upon its inner side four (or more?) short radiating canals, which spring from the base of the manubrium, and, after running forwards for a short distance, terminate each in a blind extremity. There is no trace of a circular canal.

We have thus, in the present zoophyte, a form of sporosac intermediate between that met with in *Tubularia*, with its well-developed umbrella and radiating and circular canals, and that which occurs in the greater number of cases where the umbrella has entirely disappeared.

When the gonophores approach maturity, they present upon their summit a well-defined prominent opening destined to give exit to the ova or spermatozoa.

The ova possess a deep-orange vitellus, but otherwise present nothing peculiar. They have a distinct germinal vesicle and germinal spot, and, as in most of the Hydroid zoophytes, become transformed into a Leucophrydiform embryo.

The spermatogenous tissue of the male sporosac presents very distinctly the appearance of radiating striæ, indicating a com-

position out of tubules. The spermatozoa have a long conical body with a caudal filament.

The cœnosarc of *Eudendrium bacciferum* is of an orange colour, which being visible through the transparent polypary, especially in the younger portions of the specimen, renders the zoophyte, notwithstanding its small size, eminently conspicuous among its more sombre associates, particularly when furnished with its large berry-like deep-orange gonophores.

The general character of the present zoophyte, but especially the very remarkable position of the gonophores on the summit of true, though arrested branches, affords a strong inducement to define it as a new genus; and as such I had recorded it in my note-book. I believe, however, the adoption of this course would be premature in the absence of further information regarding allied forms, which can be surely determined only when examined in their living state and while furnished with their polypes and gonophores; and I therefore consider it safer to view it for the present as a *Eudendrium*, though a very distinct species. If the result of a critical study of the various species of *Eudendrium* and its allied genera should prove the title of this zoophyte to a distinct generic rank, I would propose for it the generic name of *Corythamnium*.

#### V. *Coryne Briareus*, nov. sp.

The *Coryne* which forms the subject of the present note was found covering the surface of a stone in one of the rock-pools left upon the shore of the Forth by the retiring tide.

An irregular network of chitinous tubes adhered to the surface of the stone, and threw up at close intervals, to the height of about half an inch, wider tubes, from whose summits the polypes emerged. These polypiferous tubes themselves frequently gave off long free branches, which then bore short polypiferous ramuli, like those which spring immediately from the adherent net-like stolon.

The polypes are of a clear white, with an occasional pinkish tint given by the coloured granules of the stomach-walls. They are very extensile, and in their fully-extended state they assume nearly a cylindrical shape, their club-like form becoming almost entirely obliterated. The tentacles are very numerous, from forty to fifty, and are scattered irregularly over the body, or at most show a very slight tendency, when the polype is fully extended, to a verticillate arrangement.

The gonophores are borne in a single, somewhat verticillate cluster upon the body of the polype, having a few tentacles behind them, but the greater number in front of them. They are supported upon short peduncles, and contain each a single

Medusa, conspicuous through the walls of the gonophore by the fine carmine-coloured bands by which the inner surface of the stomach is marked.

When the Medusa escapes from the gonophore, it is seen to present a structure which is very peculiar. The umbrella is of a nearly spherical form, with two marginal tentacles continuous with two opposite radiating canals. A small bulbous dilatation is situated at the intersection of each of the other two marginal canals with the circular canal, but no tentacle is here developed. There is a wide velum. The manubrium is well developed, of a nearly cylindrical shape; and the mouth is not furnished with lobes or tentacles.

The structure of the two marginal tentacles is very remarkable. Each commences with a wide bulbous dilatation containing reddish pigment-granules, and is then, for the remainder of its length, closely set along its external side with pedunculated oval sacs filled with thread-cells.

Another striking peculiarity in the Medusa consists in a cæcal tube which is given off from each of the tentacular bulbs, and then running in the substance of the umbrella, close upon its outer surface and exactly parallel with the corresponding radiating canal, becomes slightly dilated as it proceeds, and terminates, after a short course, in a blind extremity. An exactly similar tube is given off from each of the two intermediate bulbs. The contents of these cæca are a clear fluid with thread-cells.

I propose for the *Coryne* here described the specific name of *Briareus*.

VI.—*Descriptions of new Genera and Species of Phytophagous Insects.* By J. S. BALY, Esq.

Fam. Chrysomelidæ.

GENUS DORYPHORA, Illig.

*Doryphora dilaticollis* (Dej.).

*D. oblonga*, convexa, nitido-viridi-ænea, cæruleo-micans; thorace utrinque foveolato, subremote punctato, utroque latere in laminam obliquam subacutam producto; elytris subcrebre punctatis, punctis obsolete subseriatim dispositis, interstitiis aciculato-reticulatis.

(Fœm.) Thoracis lateribus non dilatatis, rotundatis, antice angustatis.—Long. 8 lin.

Hab. Brazil.

*Doryphora cærulea*.

*D. oblonga*, convexa, nitido-cærulea; thorace remote punctato, ely-